Mean value theorem

This theorem guarantees that, at some point on a closed interval, the tangent line to the graph will be parallel to the line connecting the endpoints of that interval. The Mean Value Theorem is the following:

$$f(b) - f(a) = f'(c)(b - a)$$

Example

Let's pretend that we drive from Florida to California in exactly 48 hours, from time $t = 0$ to time $t = 48$, and travel a distance of $3{,}000$ miles.

If $f(t)$ describes the distance we've traveled at time t, then the Mean Value Theorem tells us that

$$f(48) - f(0) = f'(c)(48 - 0)$$

$$3{,}000 = 48f'(c)$$

$$62.5 = f'(c)$$

The Mean Value Theorem therefore implies that there was an instantaneous velocity of exactly 62.5 mph at least once during the trip.

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